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(71) Applicant *(for all designated States except US)*: MULTI-HOUSE AUTOMATISERING B.V. [NL/NL]; Doesburgweg 7, NL-2803 PL Gouda (NL).

(72) Inventor; and
(75) Inventor/Applicant *(for US only)*: HARDENDOOD, Theo [NL/NL]; Vredebest 15, NL-2801 AS Gouda (NL).

(74) Agent: 't JONG, Bastiaan, Jacobus; Arnold & Siedsma, Sweelinckplein 1, NL-2517 GK The Hague (NL).

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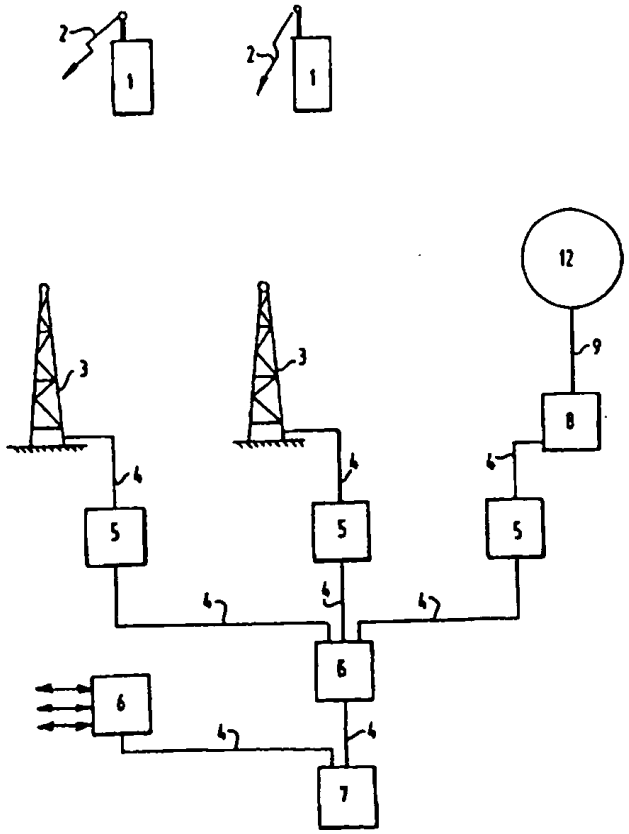
(54) Title: SYSTEM FOR DIGITAL COMMUNICATION

(57) Abstract

The invention relates to a system for digital communication of data divided into packets between at least two communication apparatuses via a network, said network comprising at least two media, wherein communication in the network is controlled by a network protocol and communication between the apparatuses is controlled by an apparatus protocol. Unabbreviated and complete transfer through the network of data and apparatus protocol information supplemented with network protocol information results in unnecessarily bulky packets, since at least some of the functions of the apparatus protocol are likewise executed by the network protocol, wherein the cost of the transfer through the network is directly proportional to the number of packets for transfer and the size of these packets. The invention has for its object to obviate the above stated drawbacks and provides to this end a system which is distinguished in that between the network and at least one of the apparatuses is placed a gate device which is adapted to code or decode the apparatus protocol information contained in a packet together with the data for transfer and to add network protocol information to the packet or remove it therefrom, and the system is further distinguished in that the gate device is adapted to transmit to an apparatus a confirmation to acknowledge receipt of a packet transmitted by this apparatus and to transfer the packet to the network for further transmission to the destination apparatus.



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SYSTEM FOR DIGITAL COMMUNICATION

The invention relates to a system for digital communication of data divided into packets between at least two communication apparatuses via a network, said network comprising at least two media, wherein communication in the network is controlled by a network protocol and communication between said apparatuses is controlled by an apparatus protocol.

It is known in the art to make use of a system wherein the data to be transferred from apparatus to apparatus and the apparatus protocol information are transferred in full and unabbreviated through the network. For this transfer through the network the packet is simply supplemented with the network protocol information required for this purpose.

TCP/IP and MPAK are for instance the apparatus protocol and network protocol respectively. One of the media of the network is, for example, the ether through which radio links are effected, wherein such a network with digital radio links is for instance the MOBITEX network.

In the case that the network contains a part which is formed by a medium through which transfer of data is only possible at a lesser rate, such as a digital radio network only having available a limited band width, the following problems herein occur.

Unabbreviated and complete transfer through the network of data and apparatus protocol information supplemented with the network protocol information results in unnecessarily bulky packets, since at least some of the functions of the apparatus protocol are likewise executed by the network protocol, wherein the cost of the transfer through the network is directly proportional to the number of packets for transfer and the size of these packets.

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The invention has for its object to obviate the above stated drawbacks and provides to this end a system which is distinguished in that between the network and at least one of the apparatuses is placed a gate device which is adapted to code or decode the apparatus protocol information contained in a packet together with the data for transfer and to add network protocol information to the packet or remove it therefrom.

In many known systems the transferring apparatus will expect under the apparatus protocol a confirmation sent within a predetermined time by the receiving apparatus to acknowledge receipt of a transmitted packet, wherein the transferring apparatus will transmit the relevant packet again when such a confirmation is not received within this time. This time duration is however usually geared to transfer of packets between communication apparatuses via a network with high transfer rates, for instance a local area network with fixed cable connections such as the datanet or the internet. Since both the packet and a confirmation to acknowledge receipt thereof are transferred through the slower part of the network at a speed lower than the transfer rate to which the repetition time of the apparatus protocol is geared, such a confirmation will not reach the transferring apparatus in good time to prevent repeated transmission of the relevant packet. The cost of transferring the packets hereby rises unnecessarily and there is the danger of the network becoming overloaded.

In accordance with the above the system is further distinguished in that the gate device is adapted to send to an apparatus a confirmation to acknowledge receipt of a packet transmitted by this apparatus and to transfer the packet to the network for further transmission to the destination apparatus.

A system according to the present invention therefore has the advantage that the size of packets for

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transfer is limited and unnecessarily repeated transmission of packets is prevented.

The invention is further elucidated with reference to the figure description of an embodiment of the invention following hereinbelow. In the drawing:

fig. 1 shows a schematic view of a system according to the present invention;

fig. 2 shows a schematic view of a local area network; and

fig. 3 shows a schematic view of a packet to be transferred by the system shown in fig. 1.

The embodiment of the invention shown in fig. 1 comprises: communication apparatuses formed by mobile stations 1 and another communication apparatus 12; a network 13, which network 13 comprises: transmitting and receiving stations 3; fixed cable connections 4; local nodes 5; regional nodes 6; and a central node 7; and a gate device 8 placed between the network 13 and the communication apparatus 12.

The mobile stations 1 are in contact with the transmitting and receiving stations by means of a radio link 3, wherein a limited band width is available for this radio link, which imposes a limitation on the transfer rate between the mobile stations 1 and the transmitting and receiving stations 3.

The transmitting and receiving stations 3 are each connected by means of fixed cable connections to a local node 5. It is noted here, that a local node can be connected to a plurality of transmitting and receiving stations 3. Three local nodes 5 are herein connected to a regional node 6 by means of fixed cable connections 4, wherein in the case shown two nodes 6 are connected in turn to a central node 7 by means of fixed cable connections 4.

An example of such a network with a hierarchical branch structure is the MOBITEX network which is particularly suitable for transferring packets of digital data, which packets together form a message. A

description follows below wherein the message is transferred from a communication apparatus 12 via the network 13 to the mobile station 1.

The communication apparatuses 12 are formed in the embodiment of the invention shown here by storage means for storing and retrieving data, wherein at the request of mobile stations 1 these means transmit requested data from their files to the mobile stations 1 via the network 13.

The making of the connection, retrieval of data from the files of servers, transmitting of the retrieved data etc. is controlled by an apparatus protocol such as the TCP/IP protocol which in practice has become a standard protocol for transfer of packets of digital data between communication apparatuses. Such an apparatus protocol, and in particular the TCP/IP protocol, is however particularly suitable for such a transfer via a network of fixed cable connections, for instance a local area network such as the ethernet or the datanet, wherein due to the high transfer rates problems are caused by a slower medium acting as a bottleneck in the network 13. Transfer in network 13 is therefore controlled by a separate network protocol such as the MPAK protocol.

In contrast to the known art, wherein network protocol information is simply added to the packet consisting of apparatus protocol information and data, a gate device 8 is arranged in the system according to the present invention, wherein a processing unit present in the gate device codes only the necessary apparatus protocol information and removes the rest and subsequently adds the network protocol information. Since correct transfer of packets through the network under the control of the network protocol is already ensured, it is for instance not necessary to also transfer separate information for this purpose in the apparatus protocol information.

Also, immediately after receiving a packet, the gate device sends back a confirmation to acknowledge receipt

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to the transmitting communication apparatus 12, which is permitted since correct transfer is already ensured under the network protocol.

In addition, the non-coded apparatus protocol information is transferred through the network once in a first packet together with the key, thus enabling decoding by the mobile station 1 of coded apparatus protocol information in following packets. It is especially notable here that the information regarding the origin and the destination in the apparatus protocol information is coded by gate device 8 to a single session code from which the mobile station 1 can identify and receive a packet transmitted thereafter.

The gate device is further provided with means for compressing the data, thereby realizing a further reduction in the number of packets for transfer and/or the size of the packets for transfer. Use can be made for this purpose of a compression algorithm which is particularly suitable for the mobile station 1 and which is supplied to gate device 8 from a communication apparatus 12, or of a compression algorithm already present in the gate device. In all functions the gate device 8 is transparent for the communication apparatuses so that the latter can operate with the same apparatus protocol irrespective of whether or not the gate device 8 is present.

In the embodiment of the invention shown in fig. 1 another gate device forms a unit with a mobile station 1, wherein this gate device removes the network protocol information and decodes the apparatus protocol information.

According to another embodiment in accordance with the present invention an additional network is situated on the destination side of the radio link 2 instead of the mobile stations 1 shown here. Such a network can take a form similar to the network shown in fig. 1 between the radio link 2 and the fixed cable connection 9.

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It is further conceivable that the network 13 contains mutual connections between local nodes 5 and/or mutual connections between the regional nodes 6. When packets forming a message are transferred via such a network the route covered by the packets is not fixed and the sequence of arrival can vary from the sequence in which the packets are transmitted as a result of different "transmission times". It will be apparent that other network configurations can also be applied.

Shown in fig. 2 are: the network 12; cable connection 9; gate device 8; cable connections 10; and communication apparatuses 11a, 11b and 11c.

The communication apparatuses 11a, 11b and 11c are for instance provided with databases, wherein a policeman can for instance retrieve from these nationally accessible databases data relating to the number plates of a car or the personal details of someone who has been detained, or wherein an employee or representative of a company can for instance retrieve from these databases placed on the company premises data relating to stock, delivery times or prices.

A selection device 14 herein provides the connection between the network 13 and one of the communication apparatuses 11a, 11b or 11c via the gate device 8.

Shown schematically in fig. 3 is the format of a packet 20 for transfer, which packet 20 comprises a part A containing protocol information and a part B containing the data for transfer.

In the embodiment shown in fig. 1 and fig. 2 the part A of packet 20 contains a block 21 of network protocol information for the MPAK protocol and two blocks 22, 23 for the apparatus protocol information of respectively the TCP protocol and the IP protocol. The whole part B of packet 20 is taken up by a block 24 with data for transfer.

When a packet 20 is transferred between a communication apparatus 12 and the gate device 8 the packet 20 does not contain a block 21 with the network

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protocol information. When a packet 20 is transferred from gate device 8 through the network 13, the block 21 containing information for the MPAK network protocol will have been added, the blocks 22, 23 containing respectively TCP apparatus protocol information and IP apparatus protocol information will have been coded by gate device 8 and the block 24 of packet 20 containing data for transfer will have been compressed by the gate device 8.

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CLAIMS

1. System for digital communication of data divided into packets between at least two communication apparatuses via a network, which network comprises at least two media, wherein communication in the network is controlled by a network protocol and communication between the apparatuses is controlled by an apparatus protocol, **characterized in that** between the network and at least one of the apparatuses is placed a gate device which is adapted to code or decode the apparatus protocol information contained in a packet together with the data for transfer and to add network protocol information to the packet or remove it therefrom.

2. System for data communication as claimed in claim 1, **characterized in that** the gate device is adapted to transmit complete coding information once through the network to a memory means in the destination apparatus or in a gate device on the destination side.

3. System for data communication as claimed in claim 1 or 2, **characterized in that** one or more than one apparatus forms a unit with a gate device.

4. System for data communication as claimed in claim 1 or 2, **characterized in that** the gate device is adapted to convert the origin information and the destination information in the apparatus protocol information into a single session code.

5. System for data communication as claimed in claim 1, **characterized in that** the gate device is adapted to send to an apparatus a confirmation of reception of a packet transmitted by this apparatus and to transfer the packet to the network for further transmission to the destination apparatus.

6. System for data communication as claimed in claim 1, **characterized in that** the gate device is adapted to code the data for transfer.

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7. System for data communication as claimed in claim 1 or 6, **characterized in that** the gate device is adapted to execute the coding in accordance with a coding algorithm chosen or supplied by a user.

8. System for data communication as claimed in claim 1, **characterized in that** the communication apparatuses are adapted to communicate under the control of the TCP/IP protocol particularly suitable for a local area network.

9. System for data communication as claimed in claim 1 or 8, **characterized in that** at least one of the apparatuses is formed by a network of communication equipment.

10. System for data communication as claimed in claim 1, **characterized in that** at least a part of the network is formed by a digital radio network.

11. System for data communication as claimed in claim 1 or 10, **characterized in that** the network is adapted to communicate under the control of the MPAK protocol particularly suitable for a digital radio network.

12. System for data communication as claimed in claim 1, 10 or 11, **characterized in that** the network is adapted to effect error-free transfer of data by means of a check sum in only the MPAK protocol.

13. Gate device for use in a system as claimed in one or more than one of the foregoing claims, which gate device comprises: a processing unit, a memory means, input and output means for connection to one or more than one communication apparatus or to one or more than one other network, **characterized in that** the gate device is adapted to code or decode the apparatus protocol information placed in a packet together with the data for transfer and to add network protocol information to the packet or remove it therefrom.

14. Packet of data and protocol information for digital communication in a system as claimed in one or more than one of the foregoing claims, **characterized in**

that during transfer between a communication apparatus and a gate device the packet comprises complete information for the apparatus protocol and the complete data for transfer, and that during transfer through the network the packet comprises complete information for the network protocol, coded information for the apparatus protocol and coded data, wherein the first packet for transfer through the network further contains the coding information.

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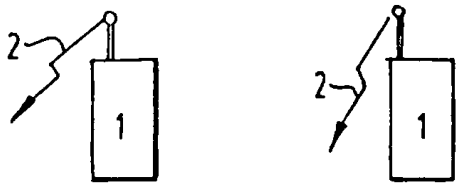

FIG.1

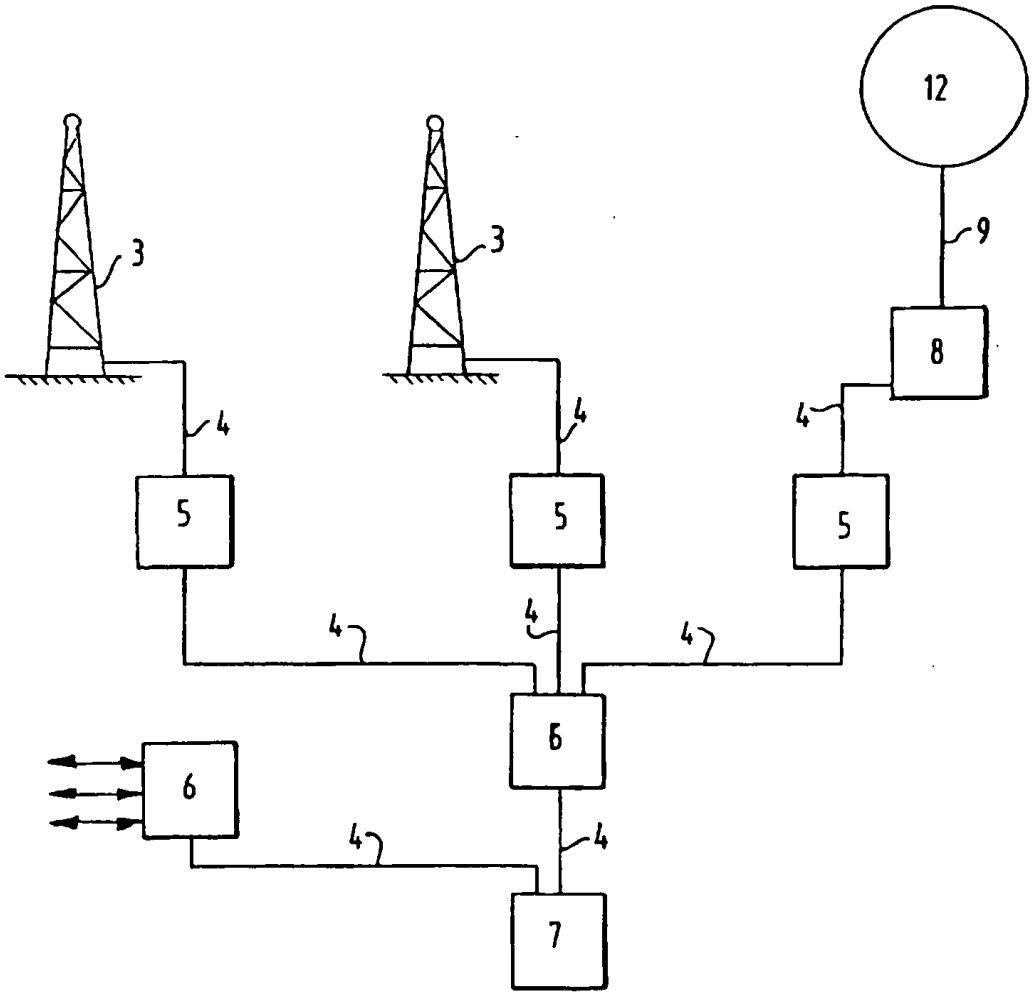

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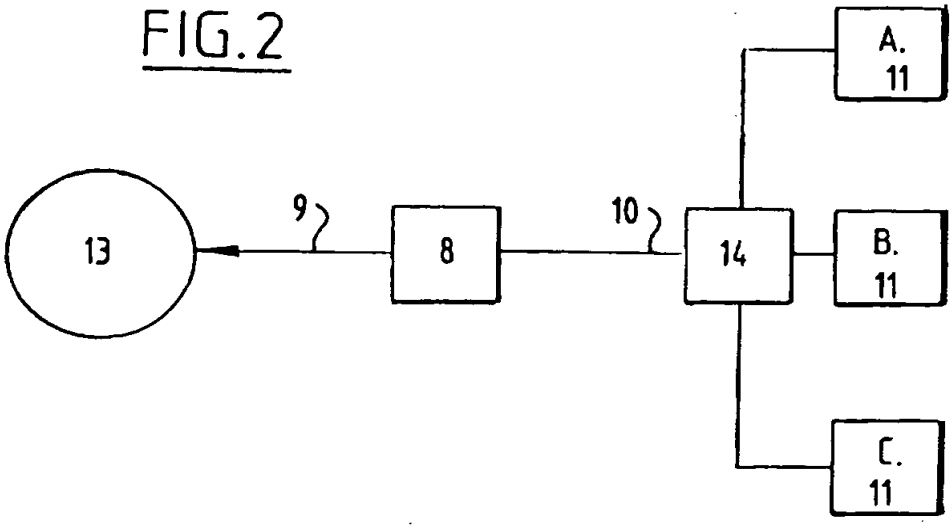
FIG.2



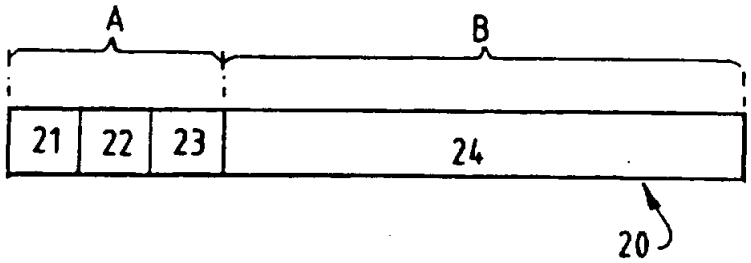


FIG.3

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(54) Title: SYSTEM FOR DIGITAL COMMUNICATION

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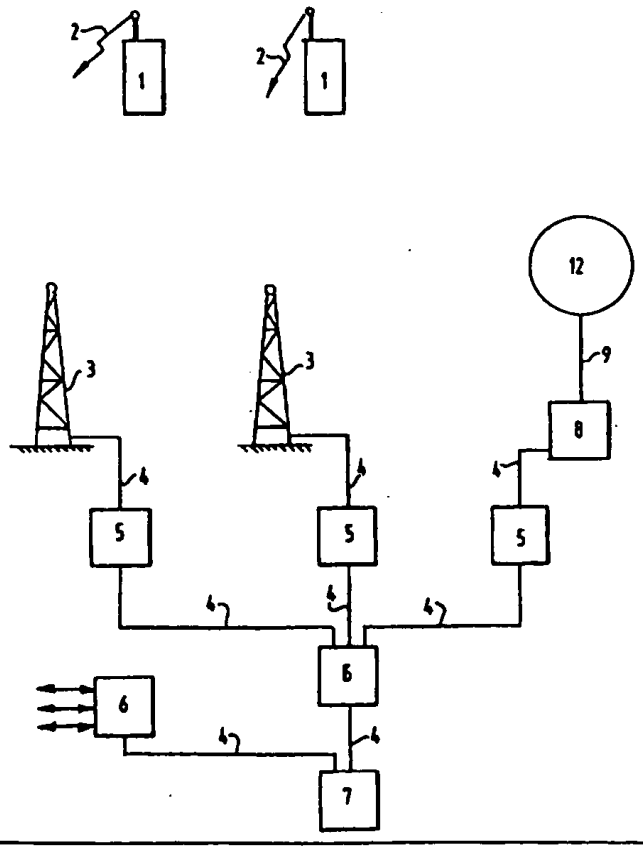

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INTERNATIONAL SEARCH REPORT

Intern: al Application No
PCT/NL 95/00334

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04L12/28

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO,A,94 08415 (CORAL NETWORK CORPORATION) 14 April 1994 see page 3, line 1 - line 26 see page 8, line 1 - page 11, line 7 see page 13, line 12 - page 14, line 5 see figures 1,3,4	1,6,8,9, 13,14
Y		5,10
Y		11,12
Y		8

Y	EP,A,0 597 640 (NCR INTERNATIONAL INC.) 18 May 1994 see column 2, line 52 - column 3, line 34 see column 6, line 2 - line 43 see column 7, line 2 - line 18 see column 8, line 16 - line 28 see figure 1 see abstract	5,10

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[X] Further documents are listed in the continuation of box C.

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1

Date of the actual completion of the international search	Date of mailing of the international search report
7 May 1996	24.05.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Canosa Areste, C

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 95/00334

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	IEE COLLOQUIUM ON CORDLESS COMPUTING - SYSTEMS AND USER EXPERIENCE, 12 January 1993, LONDON, GB, pages 1-5, XP002002261 J.B.HOLLIS: "AIR INTERFACE PROTOCOLS FOR A NATIONAL MOBILE DATA NETWORK" see the whole document	11,12
A	---	1-10,13, 14
Y	ELEKTROTECHNIK UND INFORMATIONSTECHNIK, vol. 110, no. 10, 1993, WIEN AT, pages 575-587, XP000403443 H.PICHLER: "KOMMUNIKATION ZWISCHEN LOKALEN NETWERKEN DURCH WEITVERKEHRSNETZE MIT MULTIPROTOKOLLROUTERN" see paragraph 8	8
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INTERNATIONAL SEARCH REPORT

Intern· ·al Application No
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EP-A-597640	18-05-94	JP-A-	7312597	28-11-95
		US-A-	5339316	16-08-94

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